REMARKS

Reconsideration of the rejection of the subject matter of this application is requested.

Amendments and status of claims

The claims have been amended to more clearly define the invention. Specifically, the invention is directed to a Movable Anti-Reflection Switch (MARS). This is a well-known category of device and the amendments are made to more clearly define certain characteristics of a MARS device. These amendments will assist in resolving the patentability issues. At the same time, the basic nature and intended scope of the invention remain as before.

Claims 1, 3, and 8 have been combined. Thus claims 3 and 8 have been canceled. Claim 5 was canceled previously. New claims 19 and 20 have been added to include an additional feature of a MARS device. Claims 1, 2, 4, 6, 7, and 9 -20 are presented for consideration on their merits.

The drawing

The drawing on file appears to be acceptable.

Summary of invention

Prior to addressing the rejections of record, features of applicants' invention that are relevant to the new issue raised by the citation of a new reference will be reviewed. As mentioned before, and above, the invention is directed to an

improved MARS device structure in which charge build up on the movable membrane, and stresses that cause curling of the membrane, are reduced through the replacement of the conventional silicon nitride membrane material with single crystal silicon. The pending claims now recite at least four new features that are unique to MARS devices. One the light source for the device is a laser. As the Examiner knows, the laser provides light of essentially a single wavelength. Two, the reflectivity that is changed when the device is modulated or switched is the reflectivity of the movable membrane. This is determined by adjustment to the gap between the movable membrane and a substrate below the membrane. Three, the laser light for the optical switch is incident on the movable membrane. Four (claims 19 and 20), the movable membrane moves in a very controlled fashion. The overall excursion of the membrane when moved is very small (i.e. in the approximate range 1500-5000 Angstroms as claimed), which contributes to the control and stability of the optical switch.

Issues

Rejections

Claims 1, 2, 4, 6-8, 10, 11, 13 and 18 stand rejected under 35 U.S.C. 102(b) as being clearly anticipated by Guckel et al.

Claims 1-4 and 6-18 stand rejected under 35 U.S.C. 103(a) as unpatentable over Goossen et al., in view of the patent of Neukermans et al.

Arguments

The newly cited reference, Guckel et al., describes many embodiments in which a silicon movable membrane is used. All but one relate to mechanical devices such as pressure gauges. One embodiment, illustrated by Fig. 6, is directed to an optical device. However, it will be evident to those skilled in the art that the device shown in Fig. 6 of Guckel et al. is not a MARS device. The distinctions will be addressed more specifically. Most notably, the optical device described by Guckel et al. is a display device, not a switch. As near as one can tell from the brief disclosure, they teach how to make a device that provides interference patterns, and how to change those patterns to provide color changes. They do not teach a device in which a light beam can be switched between an on (reflecting) state and an off (anti-reflecting) state.

In spite of the fact that the single optical embodiment of Guckel et al. is technologically quite different from applicants' MARS switch, there is an accidental resemblance in the structure. Accordingly, applicants are required to incorporate meaningful differences in their claimed MARS structure, and clearly point them out to the Examiner. This has been done with the amendments above. Among the differences are the four outlined above. They will be repeated, and amplified, here.

1. Applicants' light source is a laser. A key difference between the Guckel et al. device and applicants' is that applicants' device functions because the light source has a single wavelength. With appropriate design and selection of dimensions, this allows the device to be switched from a reflecting state to an anti-

reflecting state. The device of Guckel et al. cannot do this. They (obviously) use a broadband light source to provide the essential characteristics of an optical display. No matter how the membrane device is designed, it will not operate as a MARS device.

2. The reflectivity that is changed when the device is modulated or switched is the reflectivity of the movable membrane. This is determined by adjustment to the gap between the movable membrane and a substrate below the membrane. The Guckel et al. device is designed so that the changes in response to applied voltage are influenced by the gap between a glass plate (670) over the device and an underlying membrane. (Col. 7, lines 55,56). In this case the change in reflectivity is in the reflectivity of the glass plate, not the membrane.

3. The (laser) light source for applicants' optical switch is incident on the movable membrane. This is an important aspect of a MARS device. In the Guckel et al. device the (broadband) light source is incident on the glass plate.

4. (claims 19 and 20) The movable membrane moves through an approximate range of 1500-5000 Angstroms. This very limited motion is characteristic of a MARS device. Note the difference in the membrane position between the reflecting state of Fig. 1, and the anti-reflecting state of Fig. 2. The difference, as noted in the figures, is between $M\lambda/4$ and $M-1\lambda/4$, which is equivalent to $\lambda/4$. If the laser operates (for example) at 1.55 microns, $\lambda/4$ is approximately 0.4 microns. The device of Guckel et al. is designed for operation in a qualitatively different regime. The movement of their diaphragm is comparably very large. Table 1 of Guckel et al. indicates movement from 3.66

microns at the low end to over 30 microns. This further demonstrates the difference in character, operation, intended use etc. of the Guckel et al. device.

Turning to the rejection based on Goossen in view of Neukermans et al., as the Examiner indicates, the Goossen patent does indeed describe the basic elements of a MARS device. It lacks a specific reference to a single crystal silicon moveable membrane. The Examiner cites the Neukermans et al. patent to provide this feature. It is important to first point out that a MARS device is an electro-optic device. It is the electrical behavior of the moveable membrane that allows the device to perform switching functions. The devices described by Neukermans et al. are basically mirrors, and the device is a simple optical scanner. There are no teachings in the Neukermans et al. patent relevant to the electrical properties or electrical behavior of a membrane. Neukermans et al. not only fail to teach any electrical properties of the mirror, there is no teaching of the mechanical properties of the mirror. Thus there is nothing to suggest combining a simple mirror as described by Neukermans et al. in MARS device of Goossen. Both the electrical properties and the mechanical deformation of the membrane are important in a MARS device. Not only are these not suggested by Neukermans et al., but those skilled in the art would easily recognize the unsuitability of a necessarily rigid optical scanner mirror for a MARS device. Deformation of the mirror, a key characteristic of a MARS device, is a property to be avoided in an optical scanner.

With regard to the manufacturing claims 13 -17, the Office action cites the Goossen patent. However, an important feature in these claims is the starting point, namely an SOI structure, where the S layer is single crystal silicon. As

pointed out above, this feature in the context of a MARS device, or a method for making a MARS device, is absent from the prior art. Thus allowance of claims 13-17 would appear in order.

In the event that the Examiner concludes that a telephone call would advance the prosecution of this application, the Examiner is invited and encouraged to call the undersigned attorney at Area Code 757-258-9018.

Respectfully,

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